Department of Science, Information Technology, Innovation and the Arts

Land use summary 1999–2012

for the Condamine NRM region

Queensland Government

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Citation

DSITIA. 2014, Land use Summary 1999–2012: Condamine NRM region, Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

Use the Queensland Spatial Catalogue (QSpatial) to access land use datasets. Search for "land use mapping" in the search term field, after restricting your search to “cadastral and land planning” in the categories field. Metadata is also available from QSpatial: http://qldspatial.information.qld.gov.au.

Acknowledgements

We wish to acknowledge the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) who coordinate the Australian Collaborative Land Use and Management Program (ACLUMP).

The QLUMP team includes staff from DSITIA and four business centres of the Department of Natural Resource and Mines (DNRM) South Region. The input from the regions has been extremely valuable in respect of their mapping skills, local knowledge and capacity to engage regional experts in compiling updated land use mapping data.

November 2014

CCI job number:

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Introduction

The Queensland Land Use Mapping Program (QLUMP) is a joint initiative of the Department of Science, Information Technology, Innovation and the Arts (DSITIA) and the Department of Natural Resources and Mines (DNRM). QLUMP is part of the Australian Collaborative Land Use and Management Program (ACLUMP) coordinated by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). ACLUMP promotes nationally consistent land use information.

Land use and land management practices have a profound impact on Queensland's natural resources, agricultural production and the environment. The availability of consistent and reliable spatial information regarding land use is critical for sustainable natural resource management by Australian, Queensland and local governments, Natural Resource Management (NRM) regional groups, industry groups, community groups and land managers.

QLUMP has updated land use mapping in the Condamine NRM region to 2012. This report presents and summarises land use mapping in the Condamine NRM region including:

- revised 1999 and 2006 land use datasets including improvements and corrections to the originals
- 2012 land use dataset
- land use change dataset from 1999–2006, 2006–2012 and 1999–2012
- summary statistics derived from the above spatial datasets
- results of the accuracy assessment of the 2012 land use dataset.

Methodology

Mapping is performed in accordance with ACLUMP guidelines. The methodology is accurate, reliable, cost-effective, and makes best use of available databases, satellite imagery and aerial photography. QLUMP maps each catchment with the most recent suitable imagery available.

The Australian Land Use and Management (ALUM) classification (Figure 1, page 5) shows five primary classes, identified in order of increasing levels of intervention or potential impact of land use; water is included separately as a sixth primary class. Within the primary classes is a three-level hierarchical structure. Primary, secondary and tertiary levels broadly describe the potential degree of modification or impact of land use on the landscape. The secondary level in the three-level hierarchical structure is the minimum attribution level for land use mapping in Queensland.

Primary and secondary levels relate to land use (i.e. the principal use of the land in terms of the objectives of the land manager). The tertiary level includes data on commodities or infrastructure. For example, crops such as cereals or infrastructure such as urban residential. Where possible, class attribution is performed to the tertiary level. For instance, QLUMP consistently maps land use classes sugar and cotton (dryland and irrigated) to tertiary level.

The mapping scale is 1:50,000 with a minimum mapping unit of two hectares and a width of 50 metres for linear features.

The 1999 (or later where available) baseline land use dataset formed the basis for the 2012 land use dataset. The 1999 and 2006 land use maps were revised and improved in addition to compiling an updated land use map for 2012. This was achieved primarily by interpretation of

SPOT5 satellite imagery, high-resolution orthophotography, scanned aerial photography and inclusion of expert local knowledge. An ESRI ArcSDE geodatabase replication environment was utilised to overlay land use datasets on imagery and digitised or modified areas previously omitted or incorrectly mapped in 1999 and 2006 and mapped areas of actual land use change for 2012. Land use change maps are then derived (at the secondary level of the ALUM classification) between 1999–2006, 2006–2012 and 1999–2012.

Some land uses are difficult to differentiate using satellite imagery and existing databases, for example, dryland and irrigated agriculture. Therefore, local expert knowledge was an important component of the mapping methodology provided by state government regional staff, natural resource management groups, shires, agricultural industries and landholders. Field survey is also undertaken to verify areas of uncertainty.

The land use mapping methods used by QLUMP are described in full in the ABARES handbook: Guidelines for land use mapping in Australia: principles, procedures & definitions – Edition 4. This is available at www.daff.gov.au/abares/aclump

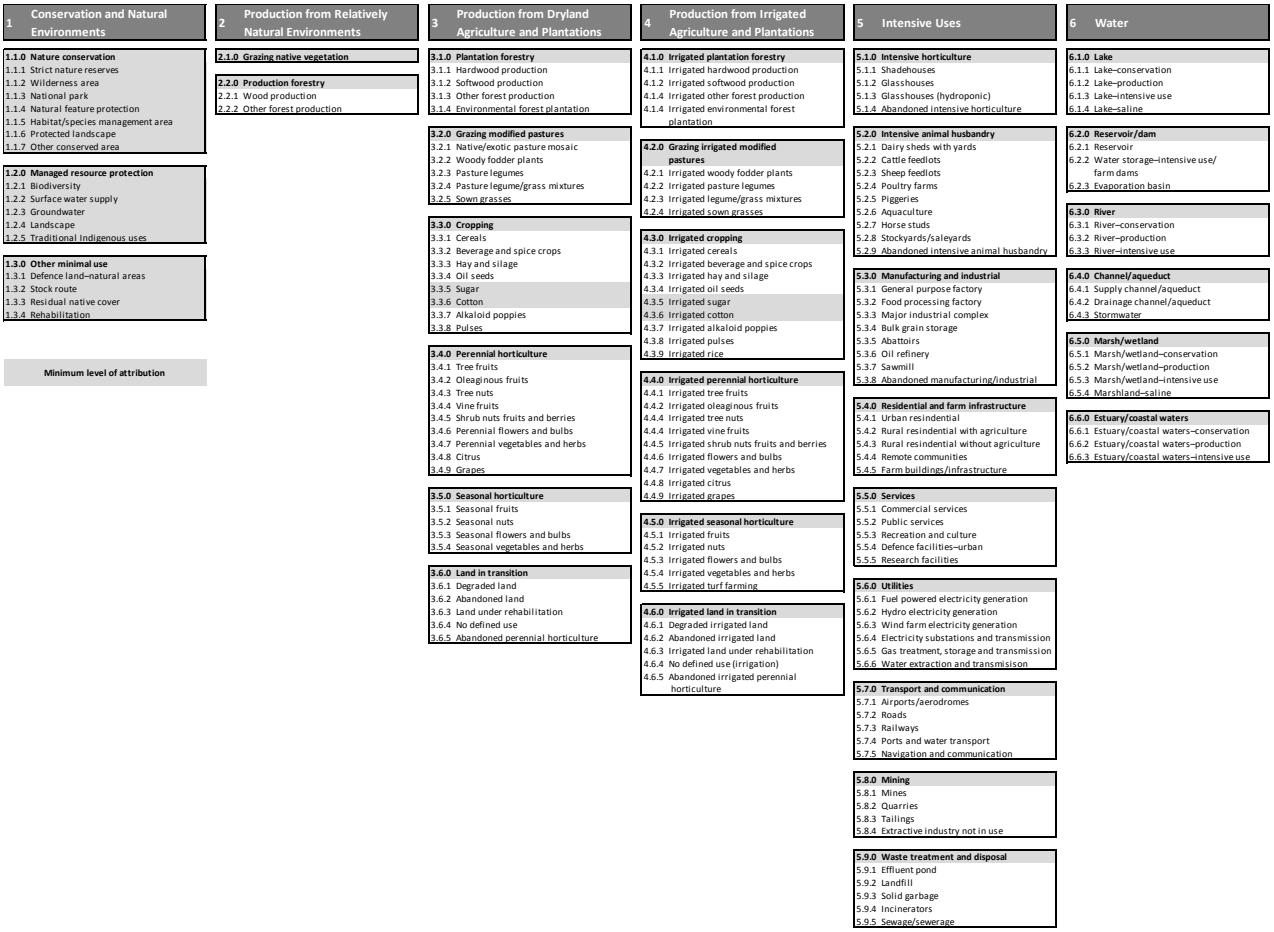

Figure 1: Australian Land Use and Management (ALUM) classification, Version 7

Data Limitations

Land use features that are linear, such as roads and railways, are not mappable at a scale of 1:50,000 with a specified minimum mapping width of 50 metres. As a result, the area estimates of these **linear features** represent only a small proportion of the actual area within this land use type in Queensland. This is of relevance to the following land use classes:

- transport and communication
- utilities
- rivers

Similarly, land uses that fall under the QLUMP minimum mapping area of two hectares are not explicitly mapped but aggregated into the surrounding land use class. This will have the effect of over-estimating the area of some land use classes. For example, other minimal use and grazing native vegetation, where tracks and farm infrastructure, road reserves, drainage lines, cleared and uncleared land adjacent to rivers, and land immediately adjacent to, or between, cropped paddocks are included.

Livestock grazing occurs on a range of pasture types including native and exotic as well as mixtures of both. Identifying and separating these using imagery, aerial photography and field observation is difficult and unreliable. Therefore, the ALUM classification secondary classes of grazing modified pastures and irrigated grazing modified pastures have not been mapped explicitly by QLUMP. These classes may be mapped with the benefit of field verification to identify, for example, dairy pastures and fodder crops. Areas of pasture which appeared to be harvested for fodder or grazed off were mapped as cropping. This may contribute an over-estimation of cropping in the region. The appearance of these can be highly variable therefore classification may not be consistent.

The distinction between (dryland) cropping and irrigated cropping was not always evident and it is likely there is some misclassification in these classes. Field survey and local knowledge were used to confirm areas of irrigation as much as possible such as proximity to water sources (watercourse or dam) as well as information from water entitlements (irrigation licences). Areas mapped as irrigated cropping are potentially irrigated on a supplementary basis and may not have actually been irrigated in 1999, 2006 or 2012.

The rural residential land use class is a source of possible thematic error. Properties on the fringes of suburban settlements, hobby farms and subdivisions in isolated localities with comparatively small lot sizes were mapped to this class. The use of Queensland Valuation System (QVAS) was helpful in mapping this class, based on whether or not the land owner was classified as a primary producer. Residential features greater than 0.2 hectares and less than 16 hectares were mapped as rural residential. This class may be misclassified with grazing native vegetation and other minimal use, especially on larger properties.

A combination of the Queensland Herbarium's wetlands and regional ecosystem datasets provided the basis for mapping *marsh/wetlands*, *lakes*, *rivers* and *reservoir/dams*. The ephemeral nature of many of these water features may lead to confusion as they may be present in one image and either absent or different in subsequent or previous dated imagery. As a result, there may be errors, omissions and disagreement in the mapping of features such as farm dams, reservoirs, lakes, wetlands and other water features. Many water features, whilst exceeding the minimum mappable area requirements, do not meet the criteria for linear or uniform features.

The 1999, 2006 and 2012 land use datasets are a snapshot of what was interpreted as the primary land use in these years. However, effort was given to distinguishing between an actual land use change and a rotation. For example, an area that is usually cropped, but is not used for that particular purpose in the year of interest, was still mapped as cropping in the 2012 dataset even though no crop was present in that year. This was not considered an actual land use change, but rather a rotation, as the primary land use for that paddock would still be cropping.

Products

1999, 2006 and 2012 land use datasets

Land use datasets for the Condamine NRM region are presented at the secondary level of the ALUM classification (Figure 1 page 5) in:

- 1999 land use dataset — Figure 2 (page 8),
- 2006 land use dataset — Figure 3 (page 10)
- 2012 land use dataset — Figure 4 (page 12)

Summary statistics for each are presented in:

- 1999 land use — Table 1 (page 9)
- 2006 land use — Table 2 (page 11)
- 2012 land use — Table 3 (page 13)

All statistics presenting the area of land use classes are reported in hectares (ha).

Table 3 (page 13) shows that grazing native vegetation (47%) and cropping (28%) are the major land use classes for 2012 in the Condamine NRM region.

Analysis of the overall change between land use classes shows the primary class of production from relatively natural environments decreased by 2% or 29,894ha from 1999–2006, with a further decrease of 1% or 8,151ha from 2006–2012. This decrease has come from the secondary class of grazing native vegetation.

The primary class of nature conservation increased by 18% or 10,682ha from 1999–2006 and again by 5% or 3,312ha from 2006–2012. This increase was primarily a result of significant expansion of the Main Range National Park.

The intensive uses primary land use class has increased by 3% or 1,882ha from 1999–2006 then again by 8% or 5,322ha from 2006–2012. While this increase came from a number of different classes, the majority of this growth was observed in the mining secondary land use class, which increased by 43% or 961ha from 1999–2006 and then by 50% or 2,234ha from 2006–2012.

Analysis of the agriculture land use classes showed that production from dryland agriculture increased by 2% or 12,404ha from 1999–2006, then decreased by 3,498ha (less than 1%) from 2006–2012. Production from irrigated agriculture increased by 2% or 2,653ha from 1999–2006, then increased again by 1% or 1,458ha from 2006–2012. Approximately half of this increase occurred in the irrigated cotton land use class.

The primary class of water increased by 15% or 2,272ha from 1999–2006 then again by 9% or 1,558ha from 2006–2012. The majority of this increase was from the secondary land use class of reservoir/dam.

Analysis of the specific land use changes from one secondary class to another for 1999–2006 and 2006–2012 is presented in the section on page 15. Analysis of the land use change from 1999–2012 has been included as Appendix A, on page 23.

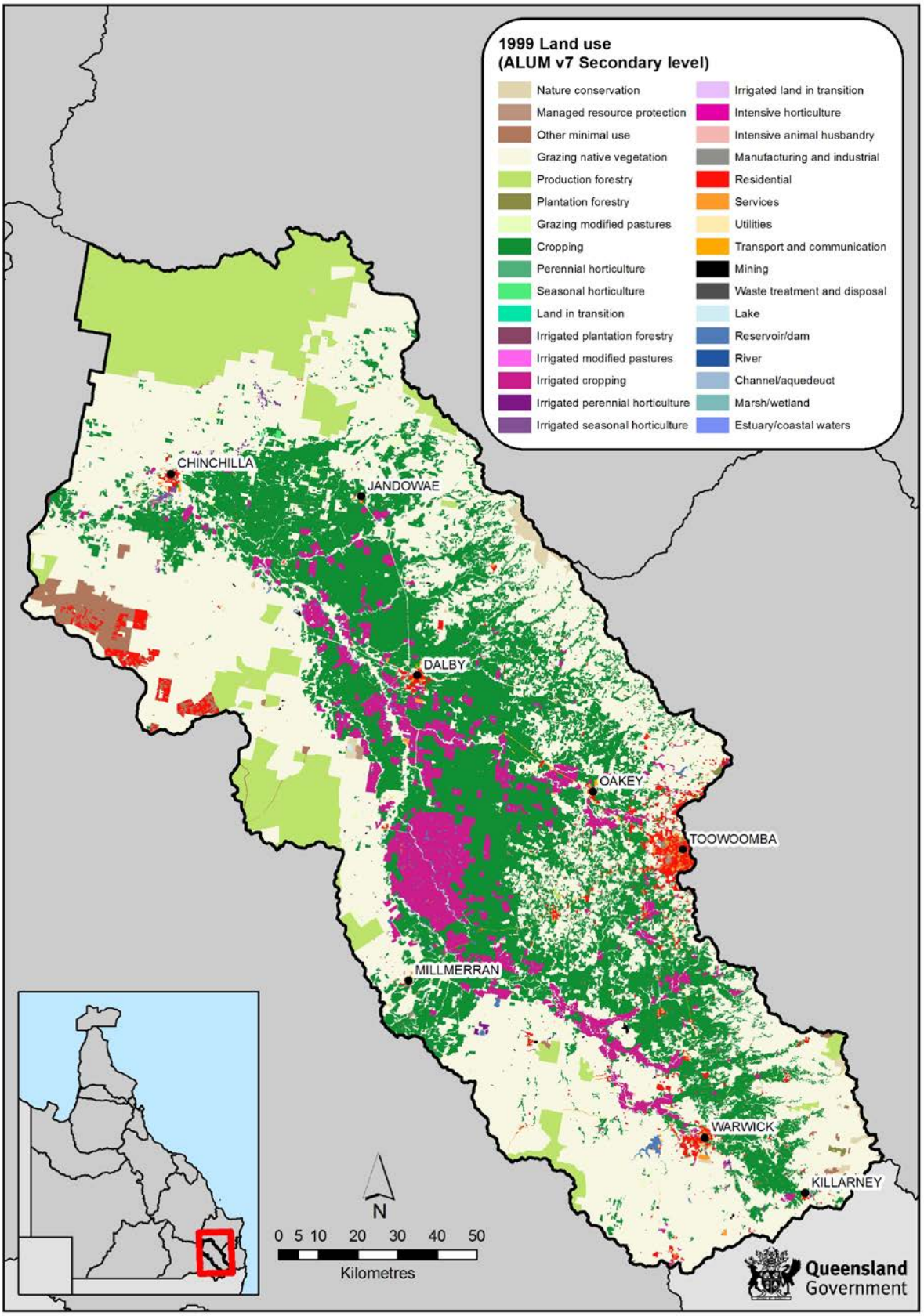

Figure 2: 1999 land use map for the Condamine NRM region

Table 1: Summary statistics of land use in 1999 in the Condamine NRM region

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	48,578	1.91
1.1	Nature conservation	15,016	0.59
1.2	Managed resource protection	708	0.03
1.3	Other minimal use	32,855	1.29
2	Production from relatively natural environments	1,542,644	60.64
2.1	Grazing native vegetation[1]	1,244,313	48.91
2.2	Production forestry	298,330	11.73
3	Production from dryland agriculture and plantations	729,516	28.68
3.1	Plantation forestry	1,262	0.05
3.2	Grazing modified pastures[2]	5,741	0.23
3.3	Cropping	721,659	28.37
3.3.6	Cropping – cotton[3]	19,416	0.76
3.4	Perennial horticulture	331	0.01
3.5	Seasonal horticulture	520	0.02
3.6	Land in transition	3	<0.01
4	Production from irrigated agriculture and plantations	154,696	6.08
4.2	Irrigated grazing modified pastures[2]	131	0.01
4.3	Irrigated cropping	151,485	5.95
4.3.6	Irrigated cropping – cotton[3]	58,629	2.30
4.4	Irrigated perennial horticulture	1,043	0.04
4.5	Irrigated seasonal horticulture	2,037	0.08
5	Intensive uses	55,841	2.19
5.1	Intensive horticulture	6	<0.01
5.2	Intensive animal husbandry	3,379	0.13
5.3	Manufacturing and industrial	1,799	0.07
5.4	Residential and farm infrastructure	39,531	1.55
5.5	Services	6,752	0.27
5.6	Utilities	62	<0.01
5.7	Transport and communication	2,754	0.11
5.8	Mining	1,298	0.05
5.9	Waste treatment and disposal	262	0.01
6	Water	12,763	0.50
6.1	Lake	508	0.02
6.2	Reservoir/dam	11,494	0.45
6.3	River	234	0.01
6.4	Channel/aqueduct	176	0.01
6.5	Marsh/wetland	351	0.01
	Grand Total	**2,544,038**	**100.00**

[1]grazing native vegetation includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]grazing modified pastures and irrigated grazing modified pastures are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of cropping – cotton and irrigated cropping – cotton are a subset of the total area of cropping and irrigated cropping respectively.

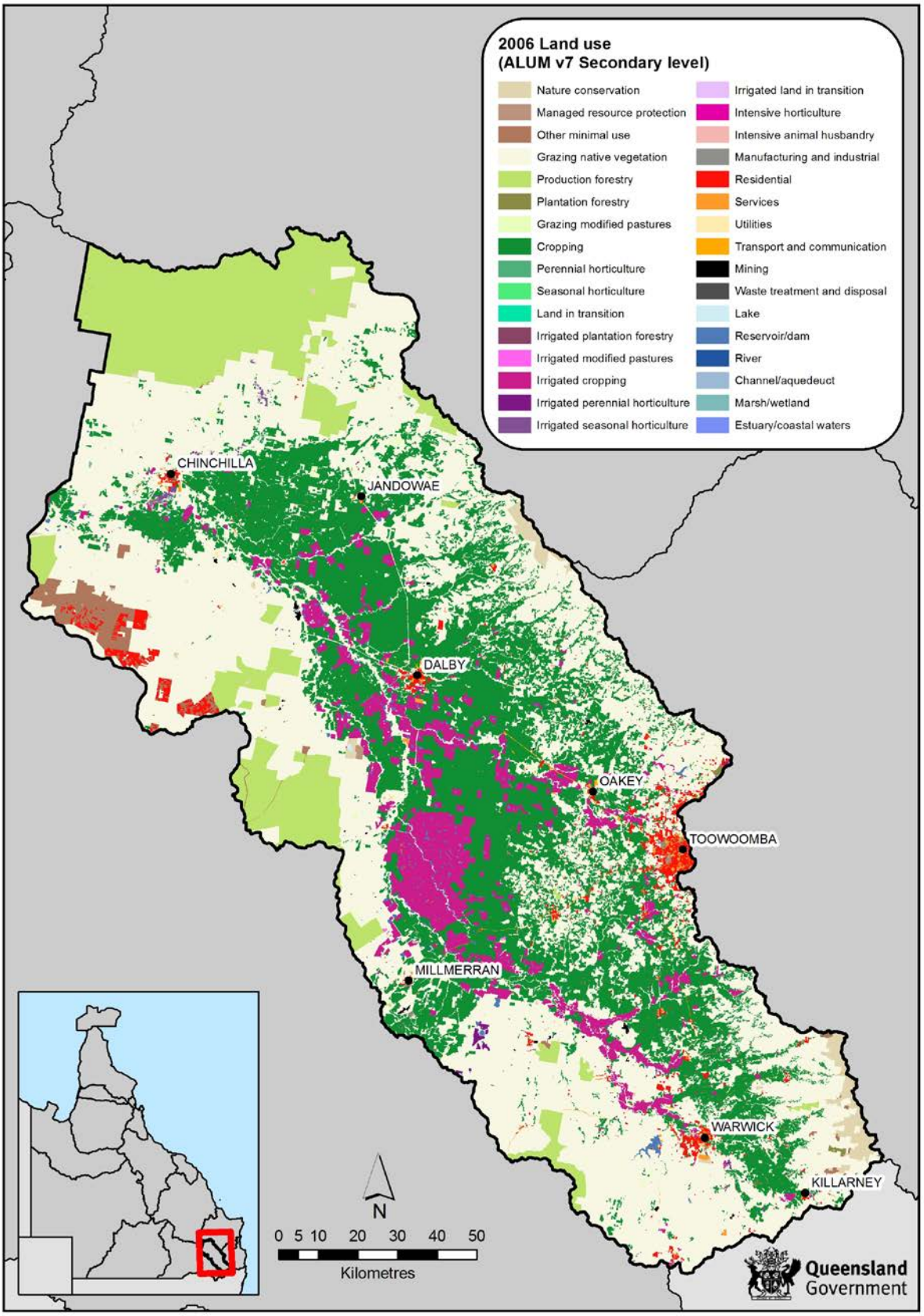

Figure 3: 2006 land use map for the Condamine NRM region

Table 2: Summary statistics of land use in 2006 in the Condamine NRM region

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	59,261	2.33
1.1	Nature conservation	25,858	1.02
1.2	Managed resource protection	756	0.03
1.3	Other minimal use	32,647	1.28
2	Production from relatively natural environments	1,512,750	59.46
2.1	Grazing native vegetation[1]	1,213,081	47.68
2.2	Production forestry	299,669	11.78
3	Production from dryland agriculture and plantations	741,920	29.16
3.1	Plantation forestry	1,262	0.05
3.2	Grazing modified pastures[2]	5,985	0.24
3.3	Cropping	733,866	28.85
3.3.6	Cropping – cotton[3]	19,429	0.76
3.4	Perennial horticulture	470	0.02
3.5	Seasonal horticulture	162	0.01
3.6	Land in transition	176	0.01
4	Production from irrigated agriculture and plantations	157,350	6.19
4.2	Irrigated grazing modified pastures[2]	222	0.01
4.3	Irrigated cropping	153,459	6.03
4.3.6	Irrigated cropping – cotton[3]	59,987	2.36
4.4	Irrigated perennial horticulture	1,999	0.08
4.5	Irrigated seasonal horticulture	1,669	0.07
5	Intensive uses	57,723	2.27
5.1	Intensive horticulture	7	<0.01
5.2	Intensive animal husbandry	3,686	0.14
5.3	Manufacturing and industrial	1,805	0.07
5.4	Residential and farm infrastructure	39,804	1.56
5.5	Services	6,836	0.27
5.6	Utilities	285	0.01
5.7	Transport and communication	2,775	0.11
5.8	Mining	2,259	0.09
5.9	Waste treatment and disposal	268	0.01
6	Water	15,035	0.59
6.1	Lake	508	0.02
6.2	Reservoir/dam	13,762	0.54
6.3	River	234	0.01
6.4	Channel/aqueduct	180	0.01
6.5	Marsh/wetland	351	0.01
	Grand Total	**2,544,038**	**100.00**

[1]grazing native vegetation includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]grazing modified pastures and irrigated grazing modified pastures are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of cropping – cotton and irrigated cropping – cotton are a subset of the total area of cropping and irrigated cropping respectively.

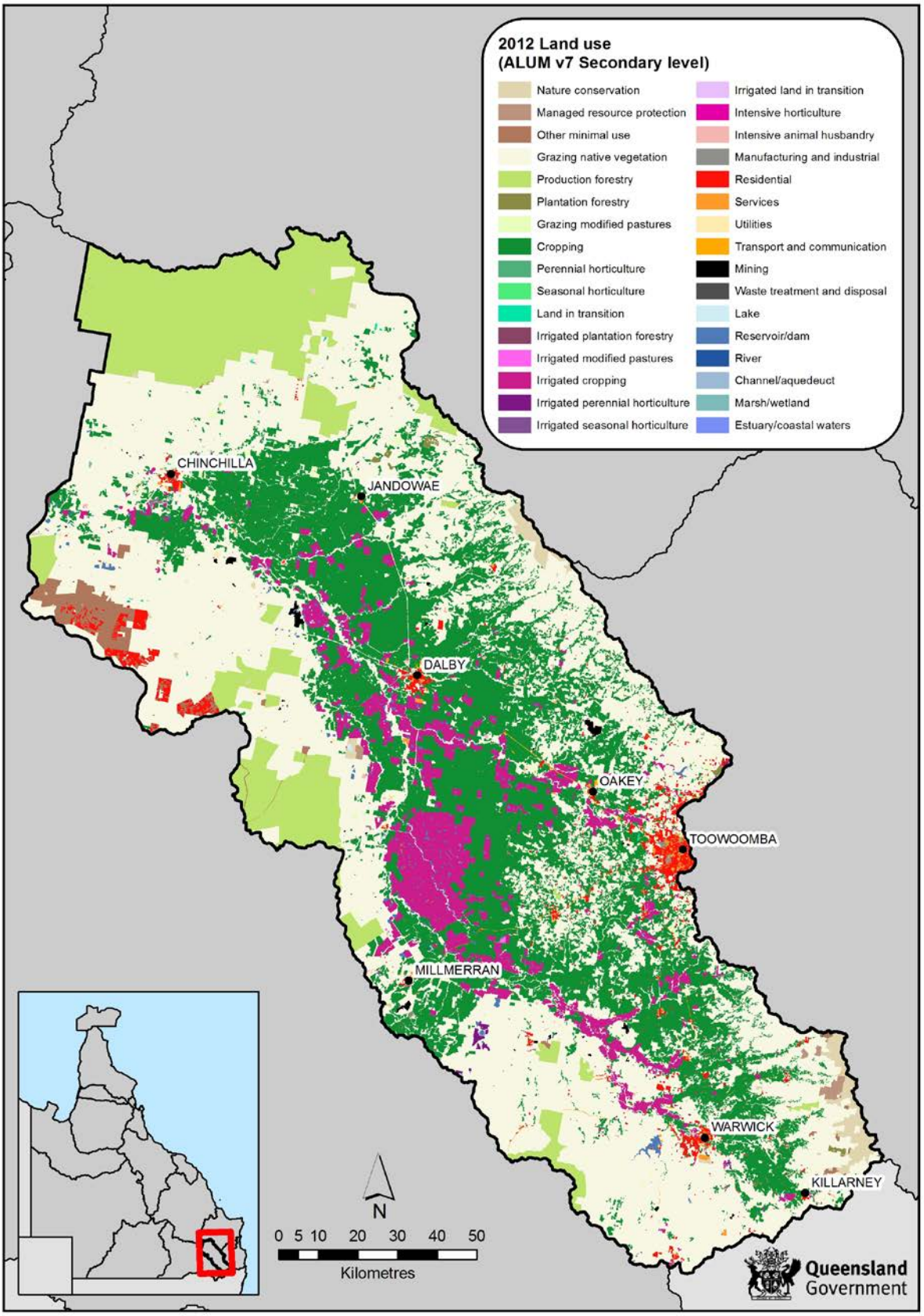

Figure 4: 2012 land use map for the Condamine NRM region

Table 3: Summary statistics of land use in 2012 in the Condamine NRM region

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	62,573	2.46
1.1	Nature conservation	26,309	1.03
1.2	Managed resource protection	3,817	0.15
1.3	Other minimal use	32,447	1.28
2	Production from relatively natural environments	1,504,599	59.14
2.1	Grazing native vegetation[1]	1,204,833	47.36
2.2	Production forestry	299,766	11.78
3	Production from dryland agriculture and plantations	738,422	29.03
3.1	Plantation forestry	2,685	0.11
3.2	Grazing modified pastures[2]	6,550	0.26
3.3	Cropping	727,959	28.61
3.3.6	Cropping – cotton[3]	19,741	0.78
3.4	Perennial horticulture	518	0.02
3.5	Seasonal horticulture	50	<0.01
3.6	Land in transition	660	0.03
4	Production from irrigated agriculture and plantations	158,807	6.24
4.2	Irrigated grazing modified pastures[2]	296	0.01
4.3	Irrigated cropping	156,253	6.14
4.3.6	Irrigated cropping – cotton[3]	60,766	2.39
4.4	Irrigated perennial horticulture	1,966	0.08
4.5	Irrigated seasonal horticulture	292	0.01
5	Intensive uses	63,045	2.48
5.1	Intensive horticulture	10	<0.01
5.2	Intensive animal husbandry	3,942	0.15
5.3	Manufacturing and industrial	1,923	0.08
5.4	Residential and farm infrastructure	41,442	1.63
5.5	Services	6,842	0.27
5.6	Utilities	1,288	0.05
5.7	Transport and communication	2,817	0.11
5.8	Mining	4,493	0.18
5.9	Waste treatment and disposal	288	0.01
6	Water	16,593	0.65
6.1	Lake	508	0.02
6.2	Reservoir/dam	15,349	0.60
6.3	River	234	0.01
6.4	Channel/aqueduct	180	0.01
6.5	Marsh/wetland	322	0.01
	Grand Total	**2,544,038**	**100.00**

[1]grazing native vegetation includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]grazing modified pastures and irrigated grazing modified pastures are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of cropping – cotton and irrigated cropping – cotton are a subset of the total area of cropping and irrigated cropping respectively.

Overall land use change by primary land use class

Figure 5 presents the overall (net) changes in land use within the Condamine NRM region by primary land use class. The graph shows the net reduction or gain for 1999–2006 and 2006–2012. Note that the first bar for each primary land use class is the 1999–2006, whilst the second is the 2006–2012 and each series sums to zero.

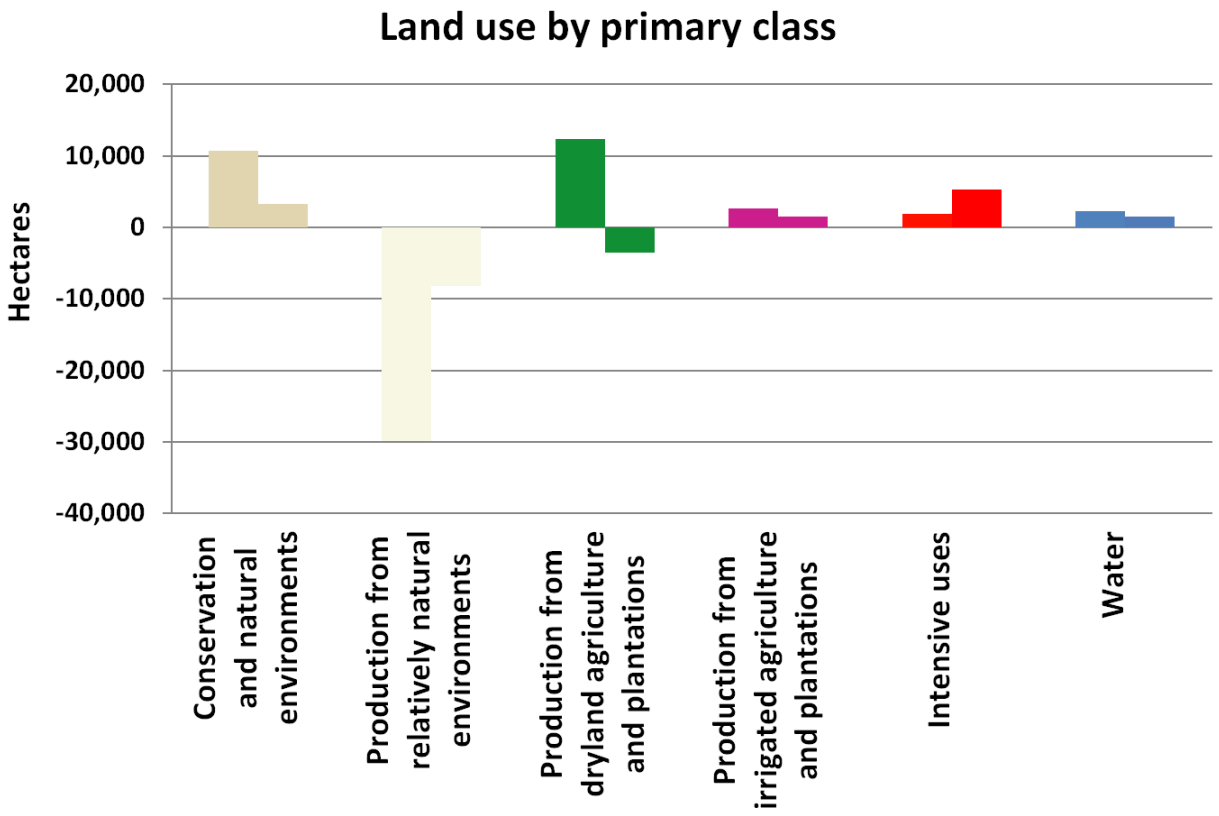

Figure 5: Net land use change by primary class (1999–2006 and 2006–2012) in the Condamine NRM region

The production from relatively natural environments primary land use class has shown an overall decline in each epoch. Interestingly the production from dryland agriculture class showed a net gain in 1999–2006, before declining slightly in 2006–2012.

Land use change datasets (1999–2006, 2006–2012 and 1999–2012)

Figures 7, 9 and 11 (pages 18, 21 and 25) show the land use change datasets for the Condamine NRM region. The data has been presented relative to the **change in intensity** of the land use at the secondary level of the ALUM classification.

For example, change from 2.1.0 (grazing native vegetation) to 2.2.0 (production forestry) is an increase in land use intensity, whilst change from 2.1.0 (grazing native vegetation) to 1.1.0 (nature conservation) is a decrease. This is highlighted in the ALUM classification (Figure 1, page 5). Moving down and from left to right through the classification, the level of intervention or potential impact of land use increases.

Land use change mapping products for this catchment have been compiled for three epochs (1999, 2006 and 2012). At the secondary level of the ALUM classification, the total area of land use change is:

- 1999–2006: 44,079ha (1.7% of the catchment). Of this 29,305ha (67% of the total change) is mapped as an increase in land use intensity, whilst 14,775ha (33%) is a decrease.
- 2006–2012: 47,279ha (1.9% of the catchment). Of this 24,735ha (52% of the total change) is mapped as an increase in land use intensity, whilst 22,544ha (48%) is a decrease.
- 1999–2012: 84,927ha (3.3% of the catchment). Of this 50,739ha (60% of the total change) is mapped as an increase in land use intensity, whilst 34,188ha (40%) is a decrease.

The land use change totals between the two eras (1999–2006 and 2006–2012) will not add up to match those compiled for the 1999–2012 era. This is because land use change mapping only accounts for land use at a specific moment in time; some change will result from rotation, whilst some may be the result of more than one change event. For example, an area mapped as grazing native vegetation in 1999 may have been mapped as land in transition in 2006 before finally becoming residential in 2012. These changes would be reflected in each of the land use change mapping products as change from grazing native vegetation to *land in transition* in the 1999–2006, and change from land in transition to residential in 2006–2012, and lastly change from grazing native vegetation to residential in 1999–2012.

Summary statistics presenting the land use change at the secondary level for 1999–2006 and 2006–2012 are shown in Tables 4 and 5 (pages 16 and 19). The change from 1999–2012 is presented in Appendix A (page 23).

The land use changes within the Condamine NRM region were predominately within the grazing and cropping land use classes—and are two-way. Gains are often offset in part by reductions and vice versa. The pie charts presented in Figures 6 and 8, (pages 17 and 20) illustrate the major fluxes within each of these land use classes, for each change era.

1999–2006 Land use change

The 1999–2006 land use change shows that the change from grazing native vegetation to cropping accounted for 16,040ha or 36% of all the total change mapped, followed by 8,234ha (19%) of grazing native vegetation changing to nature conservation (Table 4).

Table 4: Summary statistics for land use change at secondary level for 1999–2006 in the Condamine NRM region (showing only the land use changes > 75ha)

Land use code 1999	Land use class 1999	Land use code 2006	Land use class 2006	Area (ha)	Area Change (%)	Total change (%)
2.1.0	Grazing native vegetation	3.3.0	Cropping	16,040	0.63	36.39
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	8,234	0.32	18.68
2.1.0	Grazing native vegetation	2.2.0	Production forestry	3,893	0.15	8.83
3.3.0	Cropping	2.1.0	Grazing native vegetation	2,708	0.11	6.14
2.2.0	Production forestry	1.1.0	Nature conservation	2,610	0.10	5.92
2.1.0	Grazing native vegetation	6.2.0	Reservoir/dam	1,085	0.04	2.46
2.1.0	Grazing native vegetation	4.3.6	Irrigated cropping - Cotton	957	0.04	2.17
2.1.0	Grazing native vegetation	4.4.0	Irrigated perennial horticulture	957	0.04	2.17
2.1.0	Grazing native vegetation	5.8.0	Mining	791	0.03	1.79
2.1.0	Grazing native vegetation	4.3.0	Irrigated cropping	664	0.03	1.51
3.3.0	Cropping	4.3.0	Irrigated cropping	659	0.03	1.50
3.3.0	Cropping	6.2.0	Reservoir/dam	546	0.02	1.24
4.3.0	Irrigated cropping	4.3.6	Irrigated cropping - Cotton	518	0.02	1.17
4.3.6	Irrigated cropping - Cotton	6.2.0	Reservoir/dam	408	0.02	0.93
3.5.0	Seasonal horticulture	2.1.0	Grazing native vegetation	296	0.01	0.67
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	255	0.01	0.58
2.1.0	Grazing native vegetation	3.3.6	Cropping - Cotton	247	0.01	0.56
2.1.0	Grazing native vegetation	3.2.0	Grazing modified pastures	243	0.01	0.55
2.1.0	Grazing native vegetation	5.6.0	Utilities	219	0.01	0.50
4.3.0	Irrigated cropping	6.2.0	Reservoir/dam	212	0.01	0.48
4.5.0	Irrigated seasonal horticulture	3.3.0	Cropping	206	0.01	0.47
2.1.0	Grazing native vegetation	5.4.0	Residential	171	0.01	0.39
3.3.0	Cropping	4.3.6	Irrigated cropping - Cotton	171	0.01	0.39
2.1.0	Grazing native vegetation	3.6.0	Land in transition	166	0.01	0.38
3.3.0	Cropping	5.8.0	Mining	146	0.01	0.33
3.5.0	Seasonal horticulture	3.3.0	Cropping	142	0.01	0.32
3.3.6	Cropping - Cotton	4.3.6	Irrigated cropping - Cotton	124	<0.01	0.28
3.3.0	Cropping	3.4.0	Perennial horticulture	105	<0.01	0.24
4.5.0	Irrigated seasonal horticulture	4.3.0	Irrigated cropping	103	<0.01	0.23
3.3.6	Cropping - Cotton	3.3.0	Cropping	95	<0.01	0.21
2.1.0	Grazing native vegetation	4.2.0	Irrigated modified pastures	91	<0.01	0.21
4.5.0	Irrigated seasonal horticulture	2.1.0	Grazing native vegetation	91	<0.01	0.21
2.1.0	Grazing native vegetation	3.5.0	Seasonal horticulture	80	<0.01	0.18
1.3.0	Other minimal use	5.4.0	Residential	78	<0.01	0.18
1.3.0	Other minimal use	3.3.0	Cropping	77	<0.01	0.17
2.1.0	Grazing native vegetation	5.5.0	Services	75	<0.01	0.17
Total				**44,079**	**1.73**	**100**

Analysis of the 1999–2006 land use change within the grazing native vegetation and cropping land use classes is presented in Figure 6.

Clearly the largest proportion of land use change was from grazing native vegetation to cropping (16,040ha or 47% of the total change from grazing native vegetation), followed by some 8,234ha (or 24%) changing to nature conservation. Some of this change was offset (in part) by 2,708ha (85%) of change from cropping to grazing native vegetation.

Some 2,708ha or 58% of the total change from cropping went to grazing native vegetation whilst 953ha (21%) changed to irrigated cropping. Almost all (95%) of the land use change to cropping came from grazing native vegetation —16,040ha.

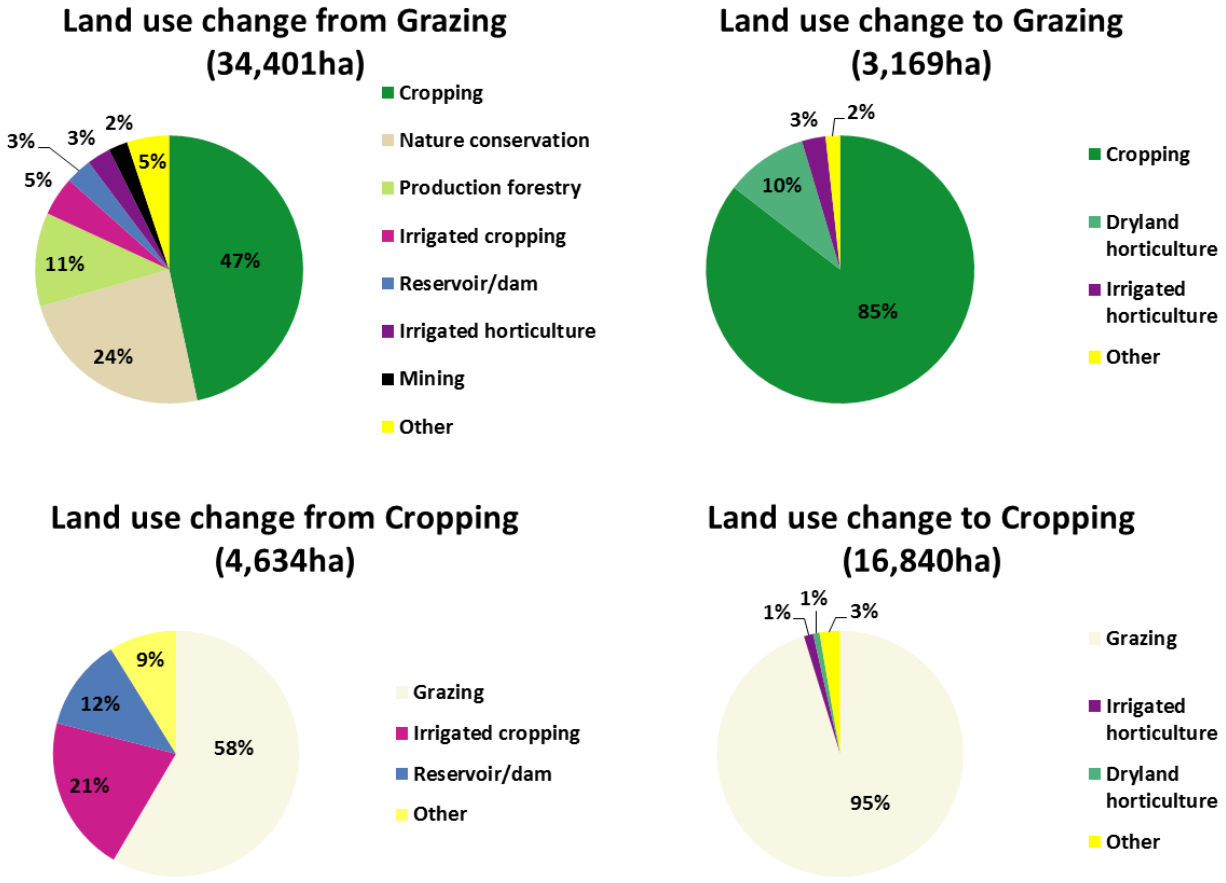

Figure 6: 1999–2006 land use change within the grazing native vegetation and cropping land use classes

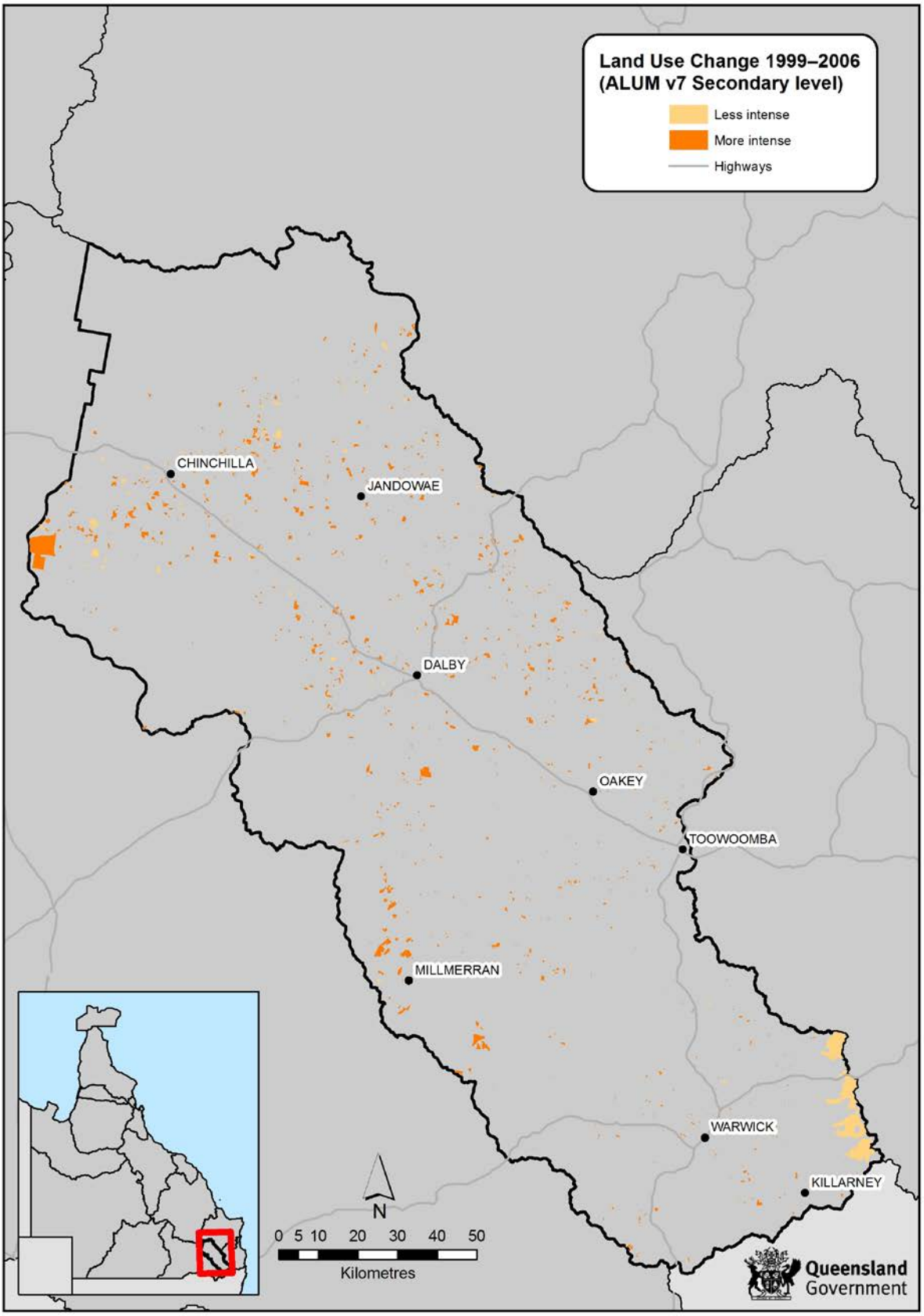

Figure 7: 1999–2006 land use change map at secondary level for the Condamine NRM region

2006–2012 Land use change

For 2006–2012, the largest land use change was observed from cropping to grazing native vegetation (14,276ha or 30%). This reduction of cropping was offset by the change from grazing native vegetation (12,265ha or 26%) to cropping (Table 5).

Table 5: Summary statistics for land use change at secondary level for 2006–2012 in the Condamine NRM region (showing only the land use changes > 50ha)

Land use code 2006	Land use class 2006	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
3.3.0	Cropping	2.1.0	Grazing native vegetation	14,276	0.56	30.20
2.1.0	Grazing native vegetation	3.3.0	Cropping	12,265	0.48	25.94
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	3,053	0.12	6.46
3.3.0	Cropping	4.3.0	Irrigated cropping	1,964	0.08	4.15
2.1.0	Grazing native vegetation	5.8.0	Mining	1,619	0.06	3.43
2.1.0	Grazing native vegetation	6.2.0	Reservoir/dam	1,263	0.05	2.67
3.3.0	Cropping	3.1.0	Plantation forestry	1,120	0.04	2.37
2.1.0	Grazing native vegetation	5.6.0	Utilities	1,035	0.04	2.19
2.1.0	Grazing native vegetation	4.3.0	Irrigated cropping	1,009	0.04	2.13
2.1.0	Grazing native vegetation	5.4.0	Residential	904	0.04	1.91
4.5.0	Irrigated seasonal horticulture	3.3.0	Cropping	888	0.03	1.88
3.3.0	Cropping	3.2.0	Grazing modified pastures	823	0.03	1.74
3.3.0	Cropping	5.8.0	Mining	731	0.03	1.55
2.1.0	Grazing native vegetation	4.3.6	Irrigated cropping - Cotton	531	0.02	1.12
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	452	0.02	0.96
4.3.0	Irrigated cropping	3.3.0	Cropping	445	0.02	0.94
2.1.0	Grazing native vegetation	3.3.6	Cropping - Cotton	358	0.01	0.76
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	332	0.01	0.70
2.1.0	Grazing native vegetation	3.6.0	Land in transition	298	0.01	0.63
2.1.0	Grazing native vegetation	3.1.0	Plantation forestry	289	0.01	0.61
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	278	0.01	0.59
3.3.0	Cropping	4.3.6	Irrigated cropping - Cotton	248	0.01	0.52
4.5.0	Irrigated seasonal horticulture	2.1.0	Grazing native vegetation	242	0.01	0.51
3.3.0	Cropping	3.6.0	Land in transition	238	0.01	0.50
3.3.0	Cropping	5.4.0	Residential	180	0.01	0.38
1.3.0	Other minimal use	5.4.0	Residential	168	0.01	0.36
3.6.0	Land in transition	5.4.0	Residential	166	0.01	0.35
3.2.0	Grazing modified pastures	2.1.0	Grazing native vegetation	162	0.01	0.34
4.3.0	Irrigated cropping	5.4.0	Residential	144	0.01	0.30
3.3.0	Cropping	6.2.0	Reservoir/dam	135	0.01	0.29
4.3.0	Irrigated cropping	6.2.0	Reservoir/dam	131	0.01	0.28
4.5.0	Irrigated seasonal horticulture	4.3.0	Irrigated cropping	124	<0.01	0.26
5.8.0	Mining	2.1.0	Grazing native vegetation	120	<0.01	0.25
4.5.0	Irrigated seasonal horticulture	3.6.0	Land in transition	71	<0.01	0.15
3.3.0	Cropping	5.2.0	Intensive animal production	64	<0.01	0.14
4.5.0	Irrigated seasonal horticulture	5.4.0	Residential	53	<0.01	0.11
Total				**47,279**	**1.86**	**100**

Figure 8 presents an analysis of the 2006–2012 land use change within the grazing native vegetation and cropping land use classes.

The largest land use change was from grazing native vegetation to cropping (12,265ha or 52% of the total change from grazing native vegetation), followed by 3,053ha (or 13%) changing to managed resource protection. Some of this change was offset in part by 14,276ha (93%) of change from cropping to grazing native vegetation. For 2006–2012 this resulted in a net gain in cropping of 2,011ha.

Some 12,265ha or 72% of the total change from cropping went to grazing native vegetation whilst 1,964ha (10%) changed to irrigated cropping. Almost all (90%) of the land use change to cropping came from grazing native vegetation —12,265ha.

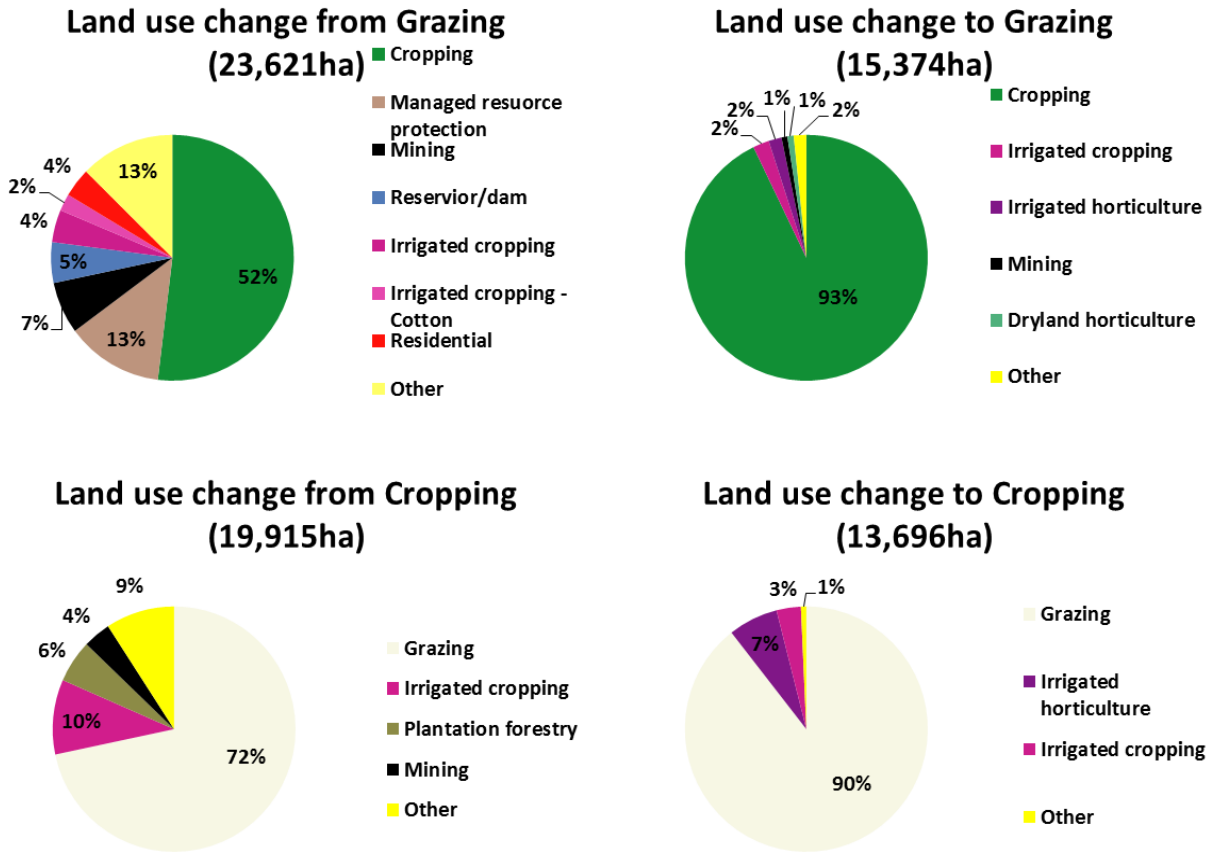

Figure 8: 2006–2012 land use change within the grazing native vegetation and cropping land use classes

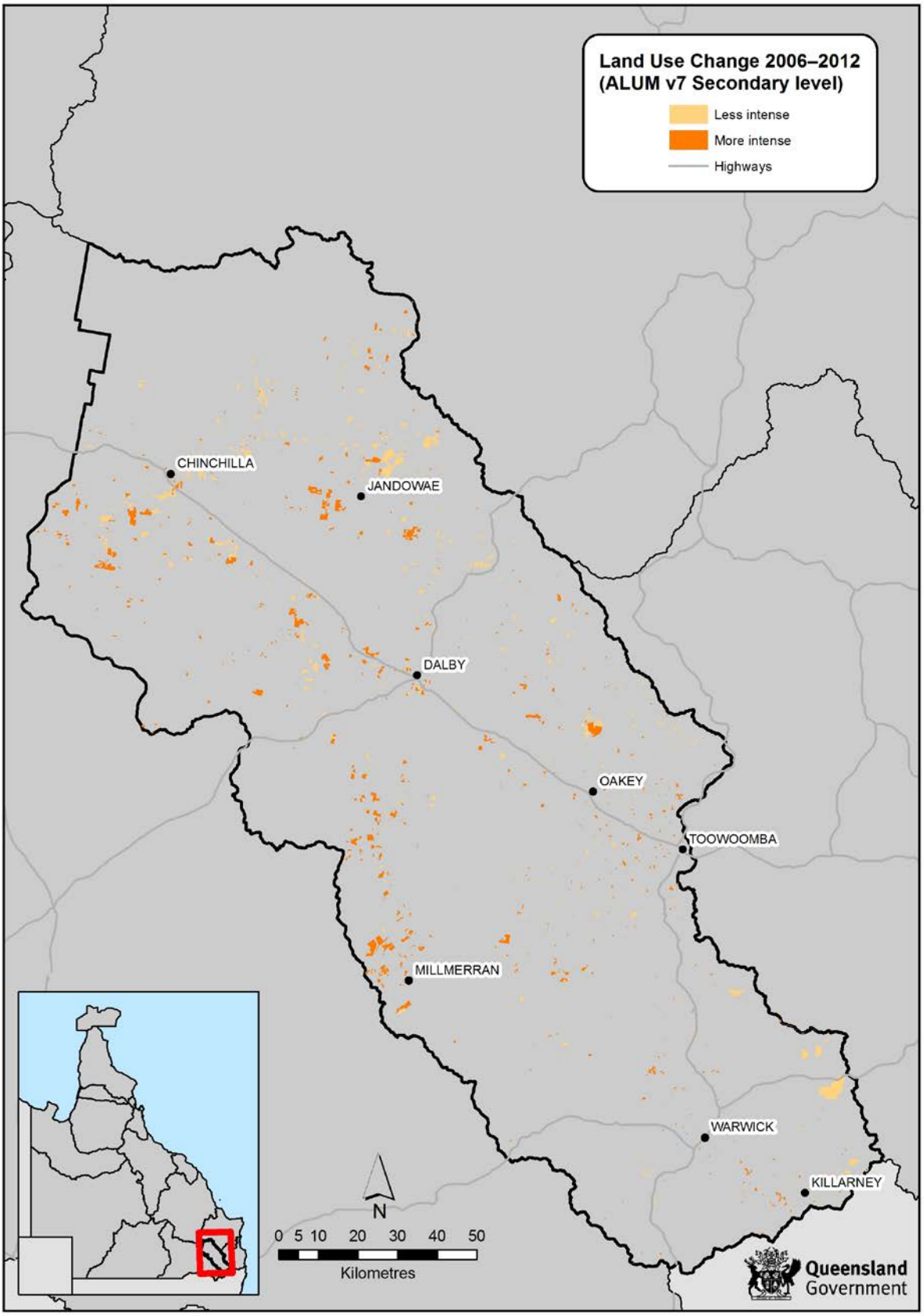

Figure 9: 2006–2012 land use change map at secondary level for the Condamine NRM region

Data format and availability

Download land use datasets

Use the Queensland Spatial Catalogue QSpatial to access land use data sets. Search for **"land use mapping"** in the search term field, after restricting your search to **"cadastral and land planning"** in the categories field. Metadata is also available from QSpatial: http://qld.spatial.information.qld.gov.au

The dataset comprises an ESRI vector geodatabase at a nominal scale of 1:50,000. Within this are six feature classes: 1999 improved land use, 2006 improved land use, 2012 updated land use, 1999–2006 land use change layer, 2006–2012 land use change layer and 1999–2012 land use change layer. The feature classes are polygon datasets with attributes describing land use. Land use is classified according to the Australian Land Use and Management Classification (ALUMC) Version 7, May 2010. Note: a representation showing land use at secondary level is available when working within a geodatabase.

Digital Data is supplied with a licence and by using the data you confirm that you have read the licence conditions included with the data and that you agree to be bound by its terms.

Request a land use map

It is possible to request a land use map from the QLUMP website based upon a specific location (Lot on Plan, Street address or Central latitude/longitude coordinates) in Queensland. The land use maps are emailed in portable document format (PDF).The maps present the most recent land use information available at the secondary level of the Australian Land Use and Management (ALUM) Classification.

View land use on the Queensland Globe

View the most recent Queensland land use information on the Queensland Globe. Use this application to browse spatial data in Queensland, including land use and up-to-date satellite imagery.

Land use is available for viewing within the Planning and Cadastre category globe.

Appendix A 1999–2012 Land Use Change

For 1999–2012, the largest land use changes were observed from grazing native vegetation to cropping (25,324ha or 30%) and cropping to grazing native vegetation (14,512ha or 17%). A further 8,685ha (10%) of grazing native vegetation changed to nature conservation. Collectively, for 1999–2012 all the land use change to cropping accounts for 27,821ha or 33% of the total, and the land use change to irrigated cropping accounts for 6,982ha or 8% of the total. Some of this increase in cropping area has been offset in part by a reduction of cropping in other areas of the catchment, with some 14,512ha (17%) changing to grazing native vegetation.

Table 6: Summary statistics for land use change at secondary level for 1999–2012 in the Condamine NRM region (showing only the land use changes > 300ha)

Land use code 1999	Land use class 1999	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
2.1.0	Grazing native vegetation	3.3.0	Cropping	25,324	1.00	29.82
3.3.0	Cropping	2.1.0	Grazing native vegetation	14,512	0.57	17.09
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	8,685	0.34	10.23
2.1.0	Grazing native vegetation	2.2.0	Production forestry	3,966	0.16	4.67
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	3,114	0.12	3.67
2.2.0	Production forestry	1.1.0	Nature conservation	2,610	0.10	3.07
3.3.0	Cropping	4.3.0	Irrigated cropping	2,350	0.09	2.77
2.1.0	Grazing native vegetation	6.2.0	Reservoir/dam	2,306	0.09	2.72
2.1.0	Grazing native vegetation	5.8.0	Mining	2,302	0.09	2.71
2.1.0	Grazing native vegetation	4.3.0	Irrigated cropping	1,844	0.07	2.17
2.1.0	Grazing native vegetation	4.3.6	Irrigated cropping - Cotton	1,488	0.06	1.75
2.1.0	Grazing native vegetation	5.4.0	Residential	1,247	0.05	1.47
2.1.0	Grazing native vegetation	5.6.0	Utilities	1,221	0.05	1.44
4.5.0	Irrigated seasonal horticulture	3.3.0	Cropping	1,092	0.04	1.29
2.1.0	Grazing native vegetation	4.4.0	Irrigated perennial horticulture	966	0.04	1.14
3.3.0	Cropping	3.1.0	Plantation forestry	915	0.04	1.08
3.3.0	Cropping	5.8.0	Mining	866	0.03	1.02
3.3.0	Cropping	3.2.0	Grazing modified pastures	779	0.03	0.92
3.3.0	Cropping	6.2.0	Reservoir/dam	744	0.03	0.88
2.1.0	Grazing native vegetation	3.3.6	Cropping - Cotton	605	0.02	0.71
4.3.0	Irrigated cropping	4.3.6	Irrigated cropping - Cotton	530	0.02	0.62
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	520	0.02	0.61
2.1.0	Grazing native vegetation	3.1.0	Plantation forestry	494	0.02	0.58
2.1.0	Grazing native vegetation	3.6.0	Land in transition	460	0.02	0.54
4.3.0	Irrigated cropping	3.3.0	Cropping	420	0.02	0.49
4.3.6	Irrigated cropping - Cotton	6.2.0	Reservoir/dam	420	0.02	0.49
3.3.0	Cropping	4.3.6	Irrigated cropping - Cotton	419	0.02	0.49
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	353	0.01	0.42
3.5.0	Seasonal horticulture	2.1.0	Grazing native vegetation	338	0.01	0.40
4.3.0	Irrigated cropping	6.2.0	Reservoir/dam	322	0.01	0.38
4.5.0	Irrigated seasonal horticulture	2.1.0	Grazing native vegetation	309	0.01	0.36
Total				**84,927**	**3.34**	**100**

Figure 10 presents an analysis of the 1999–2012 land use change within the grazing native vegetation and cropping land use classes.

Clearly the largest proportion of land use change was from grazing native vegetation to cropping (25,324ha or 46% of the total change from grazing native vegetation), followed by some 8,685ha (or 16%) changing to nature conservation. Much of the reduction in grazing native vegetation was offset by 14,512ha (92%) of change from cropping to grazing native vegetation.

Some 14,512ha or 68% of the total change from cropping went to grazing native vegetation whilst 2,350ha (11%) changed to irrigated cropping. Almost all (93%) of the land use change to cropping came from grazing native vegetation —25,324ha.

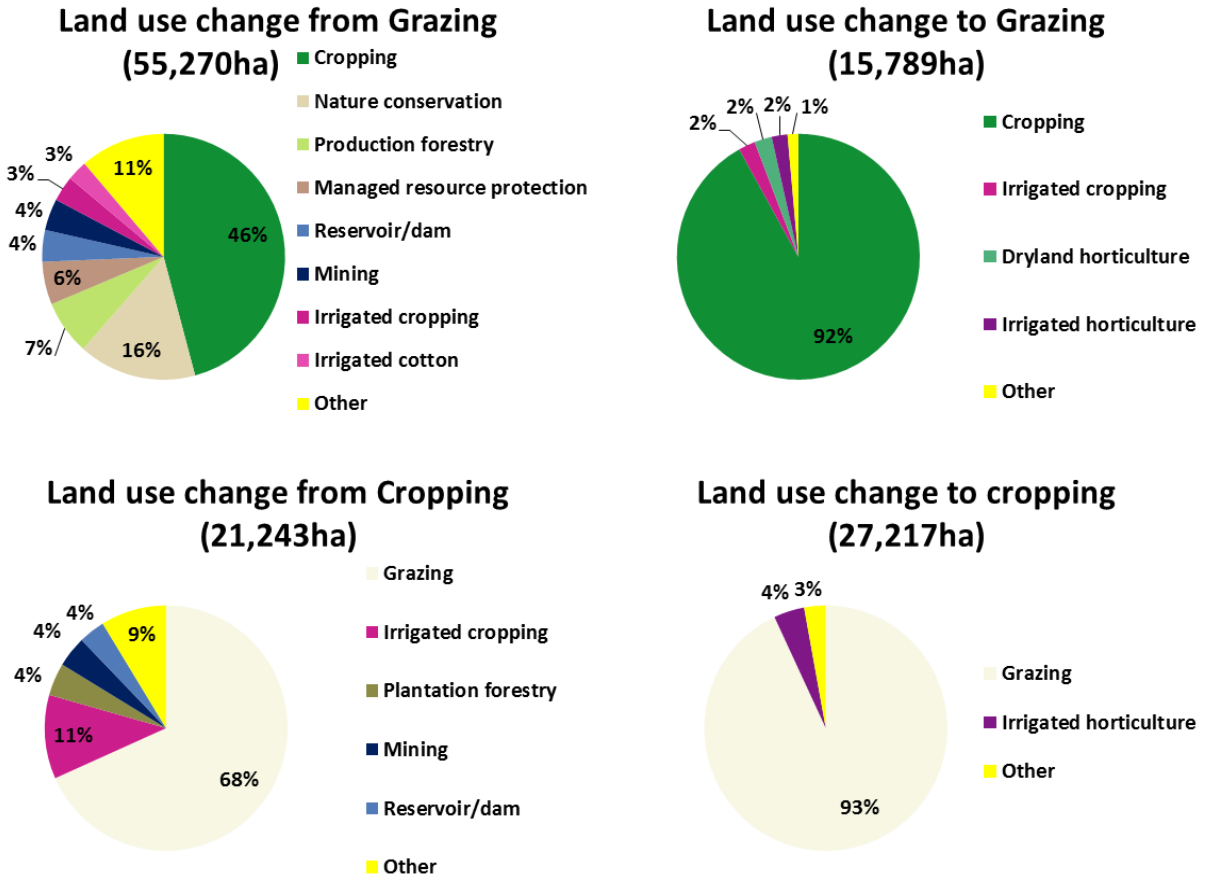

Figure 10: 1999–2012 land use change within the grazing native vegetation and cropping land use classes

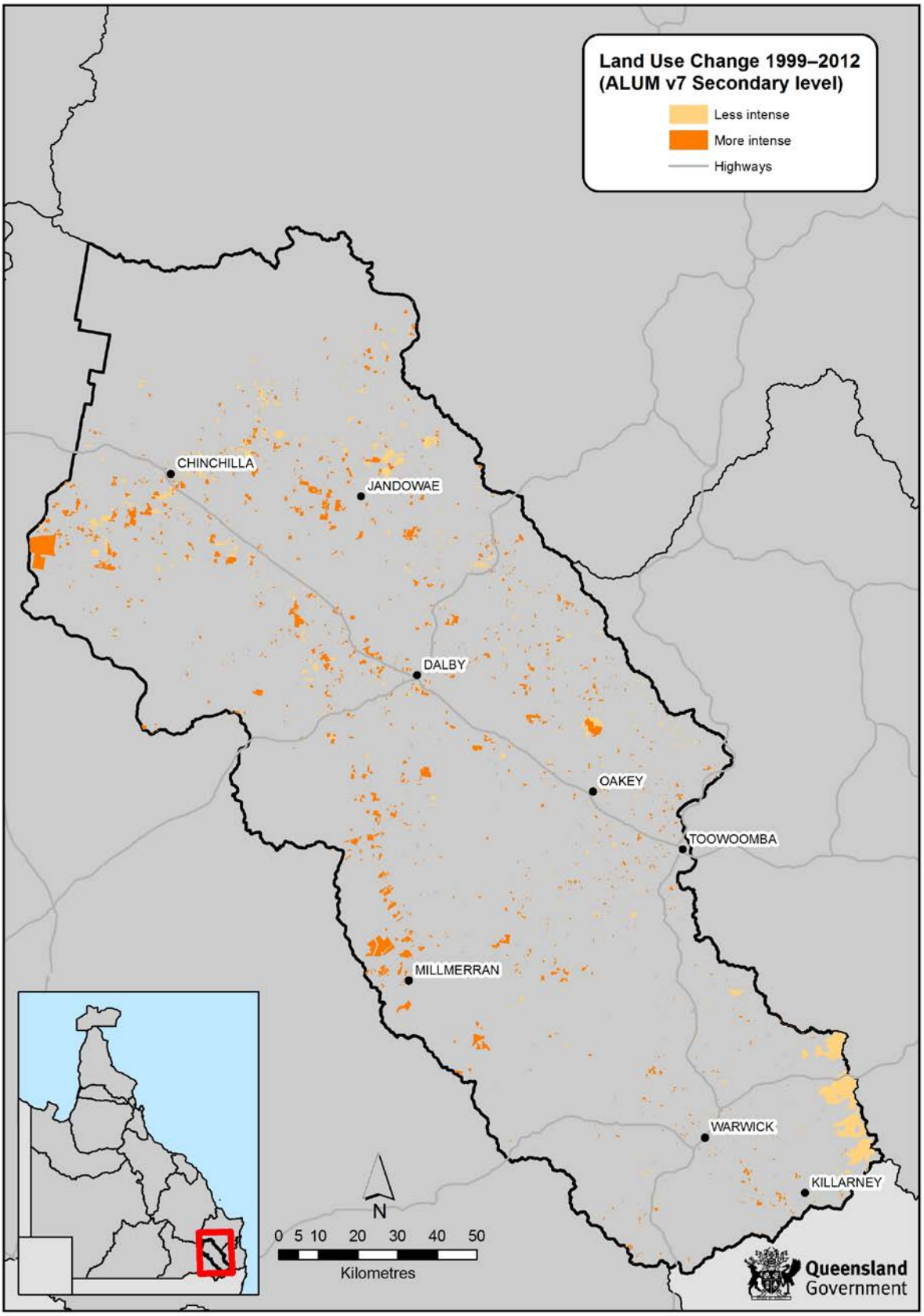

Figure 11: 1999–2012 land use change map at secondary level for the Condamine NRM region

Appendix B Accuracy assessment

The accuracy assessment provided reference data suitable for assessing the 2012 land use map. For each of the sample points, the true land use class was independently determined (this provided the reference data) based on desktop interpretation of the same imagery and ancillary datasets available to the mapper. These points were then compared to the mapped class (map data) and the information summarised in the error matrix. The accuracy is summarised in terms of total accuracy, Kappa and user's and producer's accuracies. Each accuracy parameter is reported using a point estimate and a 95% posterior interval. Accuracy figures are provided as probabilities between 0 and 1.

Total accuracy provides an estimate of the overall accuracy of the map, and can be expressed as the probability that a point is mapped correctly. However, the total accuracy may be misleading, particularly when a dominant class exists. The Kappa statistic attempts to overcome this problem by adjusting for chance agreement. A common rule of thumb suggests a value of Kappa between 0.6 and 0.8 represents moderate agreement between the map and the ground truth, a value greater than 0.8 suggests strong agreement. Values less than 0.2 suggest the map is only marginally improved compared to a map produced by random allocation.

The user's and producer's accuracies summarise the map's accuracy on a per-class basis. User's accuracy for class A is the probability that a point mapped as A is truly in class A. If the user's accuracy of class A is estimated to be 0.84, then from a random sample of 100 points chosen from areas on the map in this class, approximately 84 would be found to be correct when checked in the field. Producer's accuracy for class B is the conditional probability that the map will show a site as class B given its true state is class B. If the producer's accuracy for class B were 0.84, then from a random sample of 100 points known to be in class B, approximately 84 would also be in class B according to the map. An accurate map should have both high user's and producer's accuracies.

The per-class estimates of accuracy are often not precise, as only part of the total sample points are used to estimate them. As a guide, if the upper bound of the interval for either user's or producer's accuracy is less than 0.5, this may indicate a true misclassification problem rather than inadequacies in sample size.

Points that differ between the map and the reference data may be due to positional or spatial errors. Inaccurate registration of datasets is an example of spatial error. Thematic errors are the incorrect labelling of an area due to difficulties in determining the true land use in that area, or by oversight or other operational errors. Spatial errors influence thematic accuracy. The purpose is to assess the thematic accuracy of land use data. However, as described above, the separation of spatial and thematic errors may be difficult and were not undertaken. As a result, the accuracy assessment reflects properties of the land use data as a whole.

Note: the revised 1999 and 2006 land use and the land use change datasets were not accuracy assessed.

2012 land use dataset

The 2012 land use dataset was accuracy assessed with 478 points based on a random sampling strategy, using the map classes (area and frequency) as the strata. The stratified estimate of total accuracy is 0.95 (0.92, 0.97) and Kappa is 0.93 (0.88, 0.95). As the lower bound of the confidence interval for total accuracy is greater than 0.8, the mapping meets the ACLUMP specification.

Table 7 (page 28) shows the error matrix for the accuracy assessment of the 2012 land use data. For the majority of classes, the reference data agreed with the map data. For example, grazing native vegetation had 70 sample points identified. For 69 of those points, the map data was also grazing native vegetation and therefore correct. For one point the map data was incorrect, as the area was found to be cropping. The misclassification in this case is likely to be related to the difficulty in separating areas of grazing from areas of pasture which are harvested for fodder or grazed off (these areas are then mapped as cropping). The appearance of these can be highly variable and classification may therefore not be consistent.

The column ‘proportion’ in Table 7 is the relative proportion in area of the classes that were assessed, not of the catchment as a whole. The areas of other classes that are not amenable to assessment, for example, grazing modified pastures, are removed from the total area before the proportions are calculated. This column will total 100%.

Table 8 (page 29) provides the user’s and producer’s accuracy for the 2012 Condamine NRM region land use dataset. This demonstrates the majority of land use classes in the catchment have been mapped accurately. The largest assessable land use class in this catchment is grazing native vegetation which has been mapped with very high user’s and producer’s accuracies of 0.976 and 0.983 respectively. The next largest class by area is cropping which also returned very high user’s and producer’s accuracies of 0.976 and 0.958. The error matrix (Table 7, page 28) provides more detail on the misclassifications.

Accuracy estimates based on samples with fewer than two points are not considered sufficiently reliable, and are presented as NA (not available) in the table. Examples are seasonal horticulture and intensive horticulture.

The user’s and producer’s accuracy results should be interpreted individually for their respective classes. It should be noted that the classes with a small area in proportion to the total area assessed, and also a small sample size, will return a wide confidence interval. The overall accuracy shows a much tighter confidence interval as it effectively summarises the accuracy results for all the assessable classes.

Some classes with low accuracies have insufficient sample points to provide precise estimates. For example, the producer’s accuracy for plantation forestry is 0.778; however, from the 95% interval (0.103, 0.996) it can be seen that more sample points would be required to confidently determine class accuracy.

Table 7: Error matrix for the Condamine NRM region 2012 land use dataset

		Reference data																														
	2012 land use class	**Nature conservation**	**Other conserved area**	**Managed resource protect.**	**Other minimal use**	**Grazing native vegetation**	**Production forestry**	**Plantation forestry**	**Cropping**	**Cropping – Cotton**	**Perennial horticulture**	**Seasonal horticulture**	**Land in transition**	**Irrigated cropping**	**Irrigated cropping - Cotton**	**Irrigated perennial hort.**	**Irrigated seasonal hort.**	**Intensive horticulture**	**Intensive animal husbandry**	**Manufacturing and industrial**	**Residential & farm infras.**	**Services**	**Utilities**	**Transport & communications**	**Mining**	**Waste treatment & disposal**	**Lake**	**Reservoir/dam**	**River**	**Channel/aqueduct**	**Marsh/wetland**	**Total**	**Proportion (%)**
Map data	**Nature conservation**	**12**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0.89
	Other conserved area	0	**1**	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.15
	Managed resource protection	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.15
	Other minimal use	0	0	0	**22**	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	30	1.28
	Grazing native vegetation	0	0	0	0	**69**	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	47.63
	Production forestry	0	0	0	0	0	**20**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	11.78
	Plantation forestry	0	0	0	0	0	3	**7**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.11
	Cropping	0	0	0	0	1	0	0	**69**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	27.84
	Cropping – Cotton	0	0	0	0	0	0	0	1	**12**	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.78
	Perennial horticulture	0	0	0	0	1	0	0	1	0	**8**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.02
	Seasonal horticulture	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Land in transition	0	0	0	0	3	0	0	0	0	0	0	**4**	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	10	0.03
	Irrigated cropping	0	0	0	0	1	0	0	2	0	0	0	0	**12**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	3.75
	Irrigated cropping - Cotton	0	0	0	0	0	0	0	0	0	0	0	0	2	**13**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2.39
	Irrigated perennial horticulture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**9**	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.08
	Irrigated seasonal horticulture	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**9**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.01
	Intensive horticulture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Intensive animal husbandry	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**9**	0	0	0	0	0	0	0	0	0	0	0	0	10	0.15
	Manufacturing and industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	10	0.08
	Residential & farm infrastructure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**30**	0	0	0	0	0	0	0	0	0	0	30	1.63
	Services	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	**11**	0	0	0	1	0	0	0	0	0	15	0.27
	Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	10	0.05
	Transport and communications	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	**7**	0	0	0	0	0	0	0	10	0.11
	Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	10	0.18
	Waste treatment and disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	**8**	0	0	0	0	0	10	0.01
	Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	10	0.02
	Reservoir/dam	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	**28**	0	0	0	30	0.60
	River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	1	1	0.01
	Channel/aquaduct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	10	0.01
	Marsh/wetland	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**6**	10	0.01
	Total	12	1	10	23	82	24	7	80	12	8	1	4	17	16	9	10	1	10	12	34	14	10	7	10	9	10	28	0	10	7	**478**	**100**

Table 8: User's and producer's accuracy for the Condamine NRM region 2012 land use dataset

Class	User's			Producer's		
	Estimate	95% interval		Estimate	95% interval	
Nature conservation	0.947	0.736	0.999	0.979	0.584	0.999
Other conserved area	0.219	0.009	0.710	0.609	0.018	0.992
Managed resource protection	0.936	0.695	0.998	0.879	0.195	0.998
Other minimal use	0.715	0.540	0.854	0.935	0.579	0.992
Grazing native vegetation	0.976	0.923	0.997	0.983	0.956	0.994
Production forestry	0.968	0.838	0.999	0.992	0.956	0.998
Plantation forestry	0.650	0.353	0.878	0.778	0.103	0.996
Cropping	0.976	0.923	0.997	0.958	0.893	0.986
Cropping – Cotton	0.762	0.522	0.922	0.969	0.493	0.999
Perennial horticulture	0.742	0.442	0.934	0.426	0.023	0.977
Seasonal horticulture	NA	NA	NA	NA	NA	NA
Land in transition	0.360	0.123	0.658	0.325	0.013	0.967
Irrigated cropping	0.764	0.523	0.925	0.890	0.725	0.973
Irrigated cropping - Cotton	0.827	0.598	0.959	0.931	0.736	0.981
Irrigated perennial horticulture	0.844	0.562	0.974	0.775	0.102	0.995
Irrigated seasonal horticulture	0.842	0.552	0.977	0.246	0.016	0.759
Intensive horticulture	NA	NA	NA	NA	NA	NA
Intensive Animal Husbandry	0.843	0.563	0.974	0.765	0.192	0.972
Manufacturing and industrial	0.937	0.696	0.998	0.676	0.107	0.950
Residential & farm infrastructure	0.978	0.884	0.999	0.924	0.677	0.979
Services	0.698	0.457	0.886	0.805	0.227	0.956
Utilities	0.939	0.689	0.998	0.701	0.077	0.993
Transport and communications	0.647	0.340	0.880	0.786	0.098	0.995
Mining	0.934	0.700	0.998	0.898	0.218	0.999
Waste treatment and disposal	0.742	0.445	0.934	0.166	0.013	0.688
Lake	0.937	0.705	0.998	0.485	0.034	0.983
Reservoir/dam	0.913	0.776	0.979	0.966	0.500	0.999
River	NA	NA	NA	NA	NA	NA
Channel/aqueduct	0.937	0.704	0.998	0.253	0.012	0.960
Marsh/wetland	0.554	0.262	0.819	0.218	0.011	0.718